

46. (New) The method according to Claim 29 wherein a color filter including a plurality of color filter components organized in a predefined pattern overlies at least a portion of the array and wherein said predefined pattern comprises a Bayer pattern.

(By mail)
47. (New) The imager according to Claim 38 wherein said light sensors comprise CMOS sensors.

48. (New) The imager according to Claim 38 wherein said said first, second, third, and fourth light sensors are arranged in a Bayer pattern.

REMARKS

Examiner D. Moe is thanked for the thorough examination and search of the subject Patent Application. Claims 1, 29, and 38 have been amended. Non-elected Claims 2, 4-28, 30, 32-37, and 39-42 have been canceled. New Claims 43-48 have been added.

The making FINAL of the Restriction requirement is noted.
Non-elected Claims 2, 4-28, 30, 32-37, and 39-42 are hereby

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canceled. A divisional application will be filed to Claims 2, 4-28, 30, 32-37, and 39-42 once the elected Claims are allowed.

All Claims are believed to be in condition for Allowance, and that is so requested.

Reconsideration of Claims 1, 3, and 38 rejected under 35 U.S.C. 102(a) as anticipated by Hashimoto (US 4,768,085) is requested based on Amended Claims 1 and 38 and on the following remarks.

Applicant agrees the Hashimoto discloses an imaging device. However, Applicant notes that Hashimoto teaches (Fig. 3, column 4 lines 55-60) inputting the R, G, and B signals from the SIT2 into amplifiers 3, 4, and 5. The R and B amplifiers are white balanced while the G amplifier is not. Applicant teaches (Fig. 4 and page 13 of Specification) the use of programmable color amplifiers 156, 166, and 172 for each of the color lines where the programmable color amplifiers have programmable gain. Applicant has further made this distinction by amending Claim 1 with the additional element of:

a plurality of color amplifiers each corresponding to
one of said color filter components wherein each said color
amplifier has a programmable gain.

Likewise, Claim 38 has been amended to add the element:

a plurality of color amplifiers each corresponding to
one of said colors of light wherein each said color
amplifier has a programmable gain.

Amended Claims 1 and 38 therefore contain elements not taught in Hashimoto such that the rejection under 102(a) should be removed to place Amended Claims 1 and 38 in condition for allowance. Further, Claim 3 and new Claims 43-45 represent patentable, further limitations on Amended Claim 1 and should be in condition for allowance. Further, new Claims 47-48 represent patentable, further limitations on Amended Claim 38 and should be in condition for allowance.

Reconsideration of Claims 1, 3, and 38 rejected under 35 U.S.C. 102(a) as anticipated by Hashimoto (US 4,768,085) is requested based on Amended Claims 1 and 38 and on the above remarks.

Reconsideration of Claims 29 and 31 rejected under 35 U.S.C. 102(b) based on a public sale or use of invention. Maenaka et al (US 5,555,023) is requested based on Amended Claim 29 and on the following remarks.

Applicant respectfully asks if the Examiner intends this rejection to be based on anticipation by Maenaka rather than on a public sale or use (which is not discussed). As it appears that this is the case, Applicant directs remarks to anticipation rather than public sale or use.

Applicant agrees that Maenaka discloses a method to process signals in a video camera. However, Applicant notes that Maenaka only teaches a method to process signals in a CCD-based camera. Applicant teaches a CMOS sensor array (Specification page 12 in re Fig. 4). Applicant has further clarified this difference between Applicant's claimed invention and the teachings of Maenaka by Amending Claim 29 to include the limitation:

reconstructing color components using interpolation for at least a third portion of the array while said third

portion of the array is being read wherein said array of
pixel sensor elements comprises CMOS sensors.

Amended Claim 29 therefore contains an element not taught in Maenaka such that the rejection under 102(b) should be removed to place Amended Claim 29 in condition for allowance. Further, Claim 31 and new Claim 46 represent patentable, further limitations on Amended Claim 29 and should be in condition for allowance.

Reconsideration of Claims 29 and 31 rejected under 35 U.S.C. 102(b) based on a public sale or use of invention. Maenaka et al (US 5,555,023) is requested based on Amended Claim 29 and on the above remarks.

Applicants have reviewed the prior art made of record and not relied upon and agree with the Examiner that while the references are of general interest, they do not apply to the detailed Claims of the present invention.

Allowance of all Claims is requested.

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Attached hereto is a marked-up version of the changes made to the Claims by the current amendment. The attached pages are captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

It is requested that should Examiner A. Moe not find that the Claims are now Allowable that he call the undersigned at 989-894-4392 to overcome any problems preventing allowance.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

Please Amend Claim 1 as follows:

1. (Twice Amended) A color imaging system providing on-the-fly color interpolation using analog signals to reconstruct colors during sensor readout, the imaging system comprising:

5 an array of pixel sensor elements wherein at least part of the array is arranged in rows and columns;

 a color filter including a plurality of color filter components organized in a predefined pattern, the color filter overlaying at least a portion of the array;

10 a readout control circuit coupled to the array; [and]

 an array controller coupled to the array wherein the readout control circuit and the array controller are configured to simultaneously read out values for a group of pixel elements within a first portion of the array,

15 including at least two pixel elements from two different rows and two pixel elements from two different columns and to reconstruct color components for at least a first pixel

sensor element and a second pixel sensor element using
color information from other pixels elements within at
20 least the first portion of the array while the readout
control circuit is reading said first portion of the
array[.]; and

a plurality of color amplifiers each corresponding to
one of said color filter components wherein each said color
25 amplifier has a programmable gain.

Please Amend Claim 29 as follows:

29. (Twice Amended) A method of interpolating color
components of an array of pixel sensor elements, said
method comprising:

reading a first rectangular portion of an array of
5 pixel sensor elements simultaneously, wherein the first
rectangular portion includes pixel sensor elements from at
least two array columns and two array rows;

reading a second rectangular portion of the array of
pixel sensor elements, wherein the second portion partly
10 overlaps said first portion; and

reconstructing color components using interpolation
for at least a third portion of the array while said third

portion of the array is being read wherein said array of
pixel sensor elements comprises CMOS sensors.

Please Amend Claim 38 as follows:

38. (Twice Amended) A color imager comprising:

a first light sensor which generates a first analog output signal related to the amount of a first color of light sensed;

5 a second light sensor which generates a second analog output signal related to the amount of a first color of light sensed;

a third light sensor which generates a third analog output signal related to the amount of a second color of light sensed;

10 a fourth light sensor which generates a fourth analog output signal related to the amount of a third color of light sensed;

a circuit configured to read out the first, second, third, and fourth analog values at the same time; and

15 an interpolation circuit configured to receive said first output signal and said second output signal, wherein

said interpolation circuit provides and interpolation signal on the fly based on at least said first analog
20 output signal and said second analog output signal[.]; and
a plurality of color amplifiers each corresponding to
one of said colors of light wherein each said color
amplifier has a programmable gain.

Please Cancel Claims 2, 4-28, 30, 32-37, and 39-42.

Please Add the following New Claims:

43. (New) The system according to Claim 1 wherein said array of pixel sensor elements comprise CMOS sensors.

44. (New) The system according to Claim 1 wherein said predefined pattern of color filter components comprises a Bayer pattern.

45. (New) The system according to Claim 1 wherein said readout control circuit is programmed to selectively skip some of said groups of pixel elements to create a lower resolution said color reconstruction.

46. (New) The method according to Claim 29 wherein a color filter including a plurality of color filter components organized in a predefined pattern overlies at least a portion of the array and wherein said predefined pattern
5 comprises a Bayer pattern.

47. (New) The imager according to Claim 38 wherein said light sensors comprise CMOS sensors.

48. (New) The imager according to Claim 38 wherein said said first, second, third, and fourth light sensors are arranged in a Bayer pattern.